

AMENDMENTS TO THE CLAIMS

1. (Currently amended) A bioreactor culture system for mass producing mature conifer somatic embryos, comprising:
 - a closed vessel;
 - a biomass immobilization matrix positioned in the closed vessel, said immobilization matrix having a vertical configuration;
 - a pump enabling an adjustment of a level of a liquid culture medium contained in the closed vessel, the level of liquid culture medium substantially submerging the immobilization matrix in a first initial flooding condition, and the level of liquid culture medium being equal to or lower than a lower end of the immobilization matrix in a subsequent maturation step of the conifer somatic embryos; and
 - a liquid culture medium spraying equipment for spraying liquid culture medium onto the biomass immobilization matrix to thereby irrigate said immobilized biomass during said maturation step.
2. (Original) The culture system of claim 1, further comprising a gas control equipment for controlling the concentration of oxygen in the gas phase of the closed vessel.
- 3-5. (Cancelled)
6. (New) The culture system of claim 1, further comprising a means for periodical nutrient refreshment or replacement.
7. (New) The culture system of claim 2, wherein the gassing is at a controlled flow rate to maximize conifer somatic embryo production.
8. (New) The culture system of claim 1, wherein the closed vessel is equipped with a medium pumping port, a spray nozzle port for medium feeding and recirculation, a gas inlet and a gas outlet.

9. (New) The culture system of claim 1, wherein the immobilization matrix is made of sterilizable material.

10. (New) The culture system of claim 9, wherein the immobilization matrix comprises non-woven polyester fibers.

11. (New) The culture system of claim 1, wherein said closed vessel has a volume ranging from about 2 L to about 100L.

12. (New) The culture system of claim 1, wherein said immobilizing matrix has a vertical spiral configuration.

13. (New) The culture system of claim 1, wherein the conifer somatic embryos are selected from the group consisting of spruce, larch, pine, and hybrids thereof.

14. (New) The culture system of claim 13, wherein said spruce, larch, pine and hybrids thereof are selected from the group consisting of *Picea spp.*, *Picea glauca*, *Picea mariana*, *Picea abies*, *Picea rubens*, *Larix spp.*, *Larix decidua*, *Pinus spp.*, and hybrids thereof.

15. (New) The process of claim 14, wherein said conifer somatic embryos are selected cultivars thereof or genetically transformed.

16. (New) The culture system of claim 2, wherein said controlled gassing comprises an oxygen gas concentration maintained at about 21% for the first week of the maturation step and is dropped to about 4.2% thereafter.

17. (New) The culture system of claim 2, wherein said controlled gassing comprises an oxygen gas concentration maintained at about 21% during the whole maturation step.

18. (New) A process for the mass production of mature conifer somatic embryos in a bioreactor comprising:

(a) inoculating a suitable culture medium in said bioreactor with conifer embryogenic tissues;

(b) immobilizing said embryogenic tissues onto a biomass immobilizing matrix contained in said bioreactor, under initial flooding conditions thereof;

(c) reducing the level of said culture medium in said bioreactor to a level such that only a lower end of said matrix, or less, remains immersed in said medium; and

(d) subjecting said attached embryogenic tissues to a maturation step under controlled humidified conditions,

thereby enabling mass production of mature conifer somatic embryos.

19. (New) A process as defined in claim 18, wherein the immobilizing is carried-out while maintaining said matrix immersed in said culture medium, and a mixing of the liquid culture medium and the conifer embryogenic tissues is carried-out under low shear conditions until said embryogenic tissues attach to the immobilizing matrix and form an immobilized biomass.

20. (New) The process of claim 18, wherein said level of medium in (c) is reduced to a level below that of the biomass immobilizing matrix.

21. (New) The process of claim 18, which further comprises:

(a) installing a biomass immobilization matrix in a closed vessel of said bioreactor; and

(b) sterilizing said biomass immobilization matrix and said closed vessel, prior to the inoculating step.

22. (New) The process of claim 18, wherein the maturation step comprises:

- (a) maintaining an immobilized, maturing biomass under sterile conditions; and
- (b) spraying of a liquid medium over said immobilization matrix.

23. (New) The process of claim 18, further comprising removing most of said culture medium between said immobilizing of said tissues and said maturation step.

24. (New) A process for the mass production of mature conifer somatic embryos in a bioreactor comprising:

- (a) installing a biomass immobilization matrix in a closed vessel of said bioreactor;
- (b) sterilizing said matrix and said closed vessel;
- (c) introducing a suitable liquid culture medium in said closed vessel to immerse said matrix;
- (d) adding an inoculum suspension of conifer embryogenic tissues to said liquid culture medium;
- (e) mixing said liquid culture medium and said conifer embryogenic tissues under low shear conditions until said embryonic tissues attach to said immobilizing matrix and form an immobilized, maturing biomass;
- (f) removing most of said liquid culture medium;
- (g) maintaining said immobilized, maturing biomass under sterile conditions; and
- (h) spraying of a residual or replacement liquid medium over said immobilization matrix,

thereby enabling mass production of mature conifer somatic embryos.

25. (New) The process of claim 18, further comprising periodical nutrient refreshment or replacement.

26. (New) The process of claim 24, further comprising periodical nutrient refreshment or replacement.

27. (New) The process of claim 18, further comprising gassing of said bioreactor at a controlled flow rate to maximize somatic conifer embryo production.

28. (New) The process of claim 24, further comprising gassing of said bioreactor at a controlled flow rate to maximize somatic conifer embryo production.

29. (New) The process of claim 18, further comprising harvesting and germinating the mature somatic embryos.

30. (New) The process of claim 24, further comprising harvesting and germinating the mature somatic embryos.

31. (New) The process of claim 18, wherein said immobilizing matrix has a vertical spiral configuration.

32. (New) A culture of conifer somatic embryos obtained from the process of claim 6.

33. (New) The culture of conifer somatic embryos of claim 32, wherein at least 60% of said mature somatic embryos are morphologically normal.

34. (New) The culture of conifer somatic embryos of claim 32, wherein at least 70% of said mature somatic embryos are morphologically normal.

35. (New) The culture of conifer somatic embryos of claim 32, wherein about 90% of said mature somatic embryos can germinate.

36. (New) The culture of conifer somatic embryos of claim 32, which comprises at least about 8000, mature somatic embryos per liter.

37. (New) The culture of conifer somatic embryos of claim 32, which comprises about 15 000 mature somatic embryos per liter.